

## **REMARKS**

By this amendment, claims 2 – 6, 8 – 11, 13, 15 – 18, 20 and 23 – 25 are amended; claims 1 – 25 are before the examiner. Further examination of the application as amended and reconsideration of the objections and rejections are respectfully requested.

Claims 1 – 3 were objected to because of informalities (claim number bracketing). The form of the claims was acceptable when filed (and indeed required for electronic filing), however, the bracketing is not maintained in the present listing of claims.

Claims 4 – 25 were objected to under 37 CFR 1.75(c) and MPEP § 608.01(n) for having multiple dependent claims depending on other multiple dependent claims. The claims have been amended to the extent necessary to cancel the objectionable multiple dependencies.

Claims 2 and 3 were rejected as indefinite under the second paragraph of 35 USC 112 with respect to the designation SN in claim 2, and lack of clarity as to which separation step claim 3 refers. Claim 2 has been amended to include a definition of SN. Claim 3 has been amended to clarify the separation step referred to, and claims 5, 6, 15 and 25 are similarly amended even though not cited by the examiner in this regard.

Claims 1 – 3 were rejected as unpatentable under 35 USC 103(a) over Vidalin (US6781014) in view of Thiebaut (US6846951), Sher (US7199276), Van Egmond (US2004/0127759) or Kuechler (US2005/0113623).

The primary reference, Vidalin, is alleged to disclose each of the steps of the claimed process, but the office action concedes it does not explicitly teach a combination of steam reforming (SMR) and autothermal reforming (ATR).

Each of the secondary references, Thiebaut, Sher, Van Egmond and Kuechler, is alleged to disclose a combination of SMR and ATR operations for syngas production to

provide a more suitable stoichiometric ratio for methanol synthesis. The office action then concludes that it would have been obvious to modify Vidalin to include a combination of SMR and ATR to yield predictable results.

By way of background, the present invention is for a large-scale methanol/acetic acid plant, which can be simultaneously economical to build/operate (see paragraph [0014]) and can have a low CO<sub>2</sub> emissions rate as discussed in paragraphs [0007] and [0016]. The process can also take CO<sub>2</sub> imported from an external source as a reactant when available, further improving the CO<sub>2</sub> emissions balance. Avoiding CO<sub>2</sub> emissions into the atmosphere is growing important as concerns are raised worldwide about controlling greenhouse gas emissions. A process that can use CO<sub>2</sub> as a reactant, with the possibility to also maintain low CO<sub>2</sub> emissions to the atmosphere, is thus extremely important, and represents an advance in the art not recognized or obtained in the prior art such as the references cited.

The office action concedes the novelty of applicant's SMR/ATR arrangement, i.e., "steam reforming the first hydrocarbon stream with steam to produce a reformed stream" and "autothermal reforming a mixture of the reformed stream and the second hydrocarbon stream with oxygen and carbon dioxide to produce a syngas stream" as specified in claim 1. SMR is understood in the art to refer to a specific type of reactor arrangement wherein a mixture of the hydrocarbon and steam is passed through catalyst-filled tubes which are heated externally, e.g. by firing in a furnace. See the specification at paragraph [0024]. ATR refers to the introduction of oxygen into the feed hydrocarbon wherein partial combustion supplies the heat needed for otherwise adiabatic reforming. See the specification at paragraphs [0010] and [0015].

On the other hand, the office action appears to overlook the unusual split-serial arrangement in which the effluent from the SMR is mixed with additional fresh feed and the feed/SMR effluent mixture is then fed to the ATR with carbon dioxide. The effect of the split-feed serial SMR-ATR carbon dioxide configuration is to allow operation of the

ATR at favorable conditions, e.g. temperature and steam:carbon ratios, to maximize hydrogen production in the ATR.

In contrast, the prior art at best suggests SMR operated in parallel with ATR where the effluents, which have respectively high SN ( $>2.8$ ) and low SN ( $<2.1$ ), are combined as needed to adjust the stoichiometric ratio, and does not suggest that SMR effluent should be fed to the ATR with additional hydrocarbon feed. The prior art does not suggest the split-feed serial reformer configuration with CO<sub>2</sub> feed to the ATR specified in claim 1 that is necessary to obtain the beneficial effects of the invention.

Accordingly, it is respectfully submitted that the prior art rejections are inappropriate and can be withdrawn. Allowance of all claims is respectfully requested. If there are any remaining issues appropriate for telephone resolution, please contact the undersigned.

Respectfully submitted,

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